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**Deep
Learning**
Teaching to Mastery

University of
Cumbria 

Changing Teachers' Beliefs through the Whole-Class Approach of a Mastery Maths Programme

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'mastery' as philosophy

'...under appropriate instructional conditions
virtually all students can and will learn well
most of what they are taught'

Block & Anderson 1975

'mastery' as belief

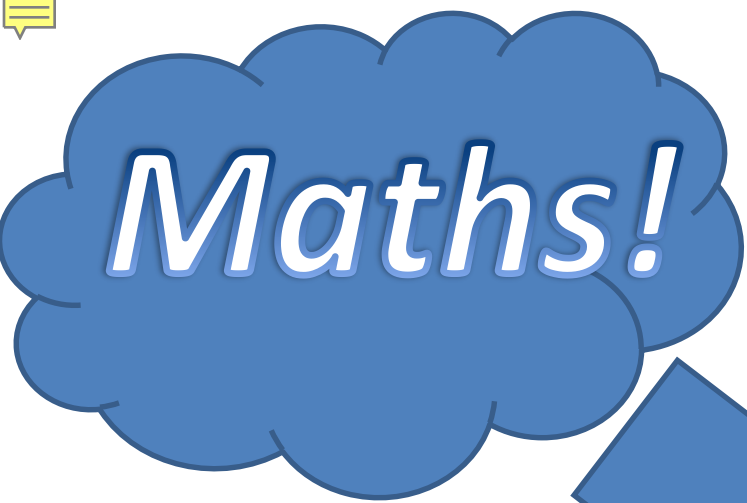
The more you practice, at the edge of your
current attainment, the smarter you get...

Dweck 2006



mastery approaches to maths

- Whole class approach
- Focus on core skills and knowledge
- Exploring contextualised problems
- Dialogue rich classrooms
- Authentic real world problems
- Use of concrete materials
- Mathematical variation
- Teachers believe that virtually all children can and will learn and succeed in maths



Basil Bernstein's Rules for transforming knowledge:

distributive

recontextualising

evaluative



school maths



school maths = real maths

1. Authentic tasks...
2. Make it more open...
3. Make it an inquiry...
4. Add a visual component...
5. Problem first then technique...
6. Accept all ideas for critique...
7. Ask pupils to convince and reason...

Deep Learning Alliance

- **Anchor task: exploring, structuring, journaling**
- **Reflect and refine: using the text book**
- **Practice: mathematical variation extending thinking**





metacognition & self-regulation

Are powerful drivers of learning ([EEF Toolkit](#))

1. During whole class exploration of a well-designed anchor problem ask: to what extent is my framing of learning promoting metacognition?
2. In developing journaling ask: to what extent have I taught my pupils to effectively communicate their thinking? Are they thinking critically?



Toolkit Strand ^

Cost v

Evidence Strength v

Impact (months) v

Feedback

High impact for very low cost, based on moderate evidence.



+8

Meta-cognition and self-regulation

High impact for very low cost, based on extensive evidence.



+8

Mastery learning

Moderate impact for very low cost, based on moderate evidence.



+5

Peer tutoring

Moderate impact for very low cost, based on extensive evidence.



+5

Collaborative learning

Moderate impact for very low cost, based on extensive evidence.



+5

Small group tuition

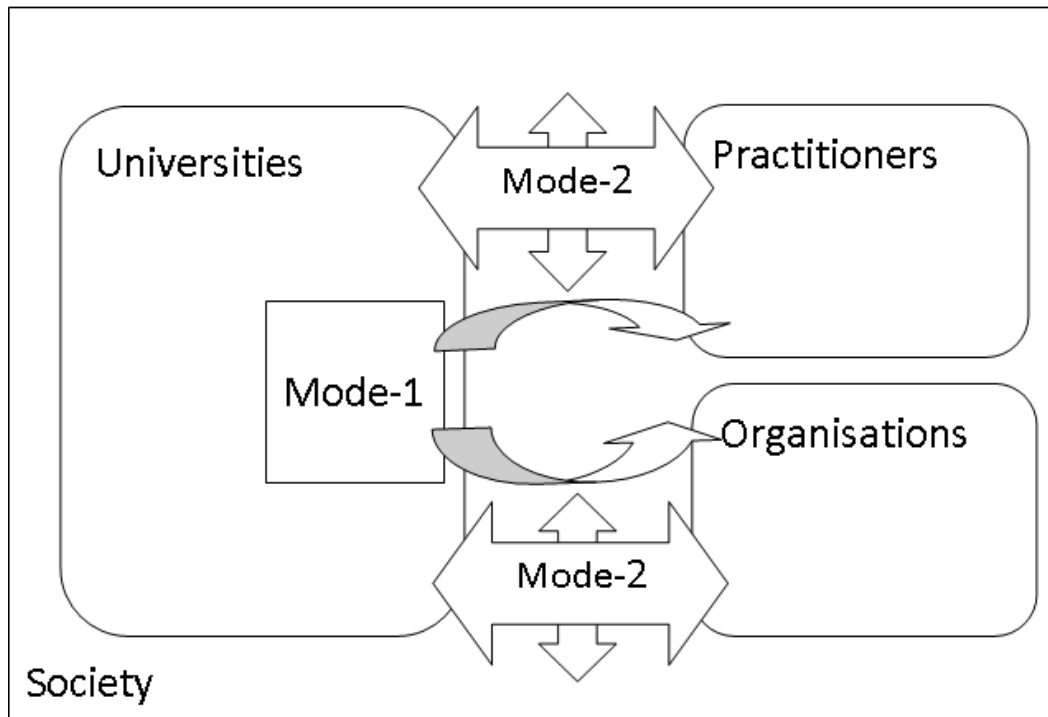
Moderate impact for moderate cost, based on limited evidence.



+4

our collaborative R&D project

- Seven teacher researchers
- Classroom video stimulated recall interviews
- Collaborative analysis



How is involvement in the mastery maths project influencing teachers' orientation towards maths and their expectations for children?

professional inquiry: video



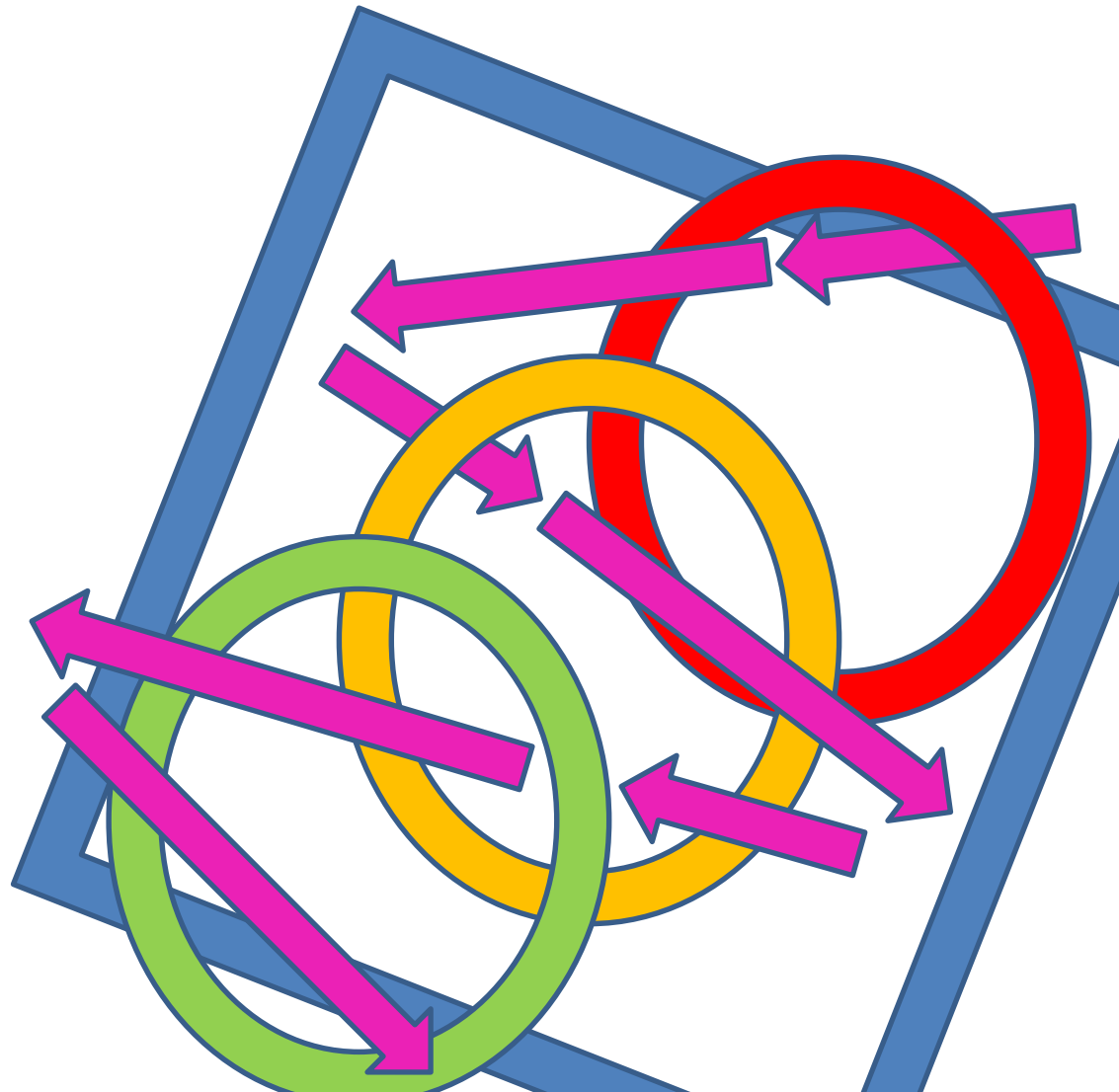
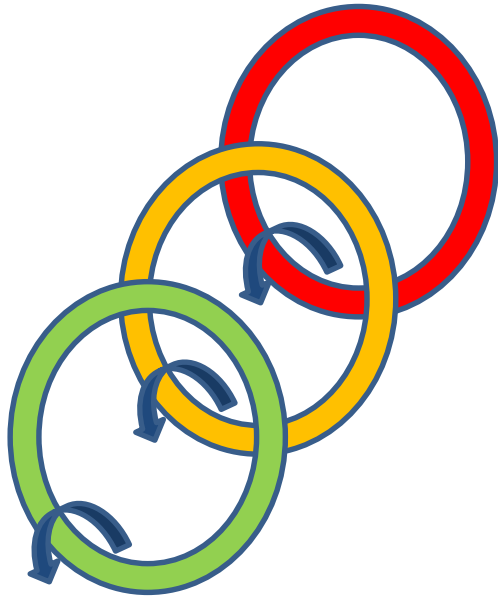
framing



...for me it's the idea of that mathematical fluency coming out, the shift from the old style didactic teaching with the teacher stood at the front saying, 'here is the rule of the day'. The children are gaining ownership of emerging rules, the mathematical rules are coming almost through the children's exploration, they are not explicitly being taught...



framing



planning



It's revolutionised my teaching. My subject knowledge is beyond anything it ever was. I enjoy maths, I have an enthusiasm for maths and I think the depth of rehearsal I go through for my lessons, I would never, ever have had that freedom or time to do it if I didn't have the textbooks...



planning

- Teachers come to 'trust' the textbooks and place high value on the texts and teacher guidance
- The pedagogy is built in to the text books...the text books come out half way through the lesson
- Teachers feel they are learning about maths and how to teach maths
- The books **could easily** lead to dull lessons if you try and teach traditionally with them...

grouping



...it is more about that facilitating learning. You're presenting the children with an opportunity, they come out with the outcomes themselves; the reasoning themselves. There's even less of a need for the children to be ability grouped...



grouping

Setting or streaming

Negative impact for very low cost, based on moderate evidence.



- Setting or grouping is in tension with the underpinning beliefs of a mastery approach...
- Explore mixed pairs activity...random, high-low, personalities...and zoning...
- Consider a phased approach to moving away from grouping by prior attainment...

intelligence



...I think with maths you're continually learning. You're learning different ways; you're learning different methods. I know when I was at school it was all about conventions...so I think you're always learning and your intelligence is not capped...and it's a case of you are always learning, you're increasing the amount of intelligence you have in maths...



intelligence

- Systematically and collectively, in intention and in practice - stop labelling learners
- Work on collective teacher awareness of mindset theory and teacher expectations
- Work on the multidimensionality of maths...domain specific mindset means that cultural beliefs about maths are just as important as beliefs about intelligence

<https://bhi61nm2cr3mkgk1dtaov18-wpengine.netdna-ssl.com/wp-content/uploads/2017/05/When-You-Believe-in-Your-Students-They-Do-Better.pdf>



becoming a mathematician

Let's consider the work of a mathematician: She first has to pose an important problem, then map out a mathematical approach, she will probably collaborate with others on ideas, and engage in...a zig-zagging process of conjecturing, refining counter examples and proving. She has to form a mathematical model, apply methods, draw diagrams, connect ideas, reason about connections and communicate in different forms. The work is multidimensional.



**Deep
Learning**
Teaching to Mastery

- External knowledge
- Subject specific
- Time and rhythm
- Classroom experimentation
- Congruence within training
- Shared sense of purpose
- Collaboration and trust
- Proactive leadership

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*Effective CPD
for teachers*

Mastery Maths CPD Resource

- Two video lessons using Maths No Problem!
- Including debriefing discussion with the teachers
- With our reflections and ideas on mastery maths professional development
- Open access online...



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